

# Antenna Test Report

For

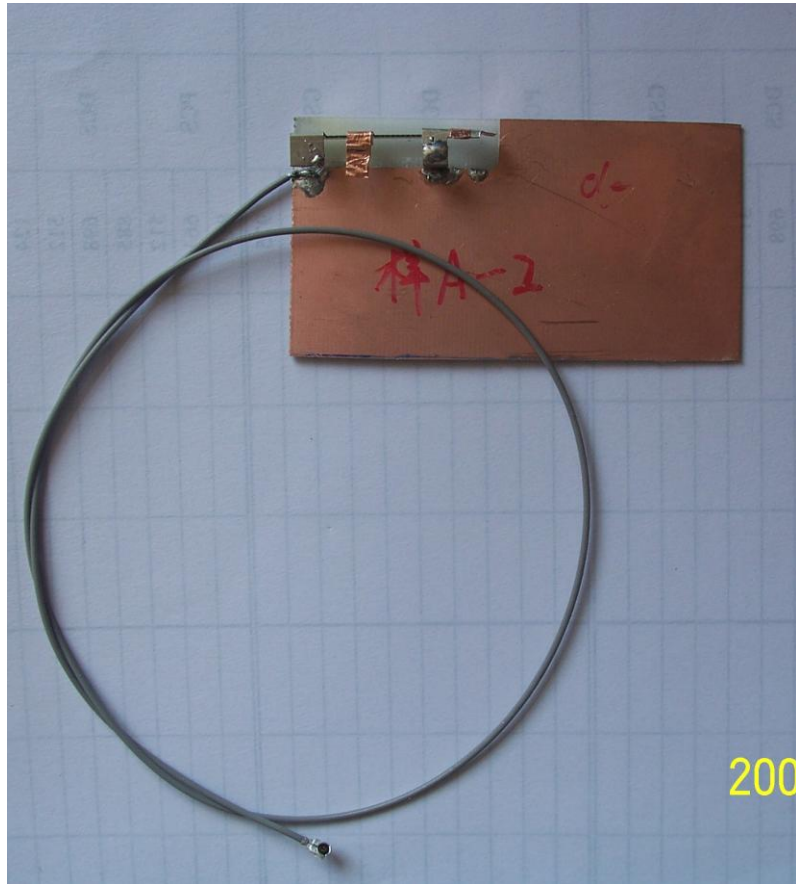
Intel project

|          |                                  |         |     |
|----------|----------------------------------|---------|-----|
| Customer | Intel                            | Project | --- |
| Band     | 2.3~2.7&3.3~3.8<br>&5.15~5.85GHz | Color   | --- |
| SUC PN   | ---                              | Version |     |

|              |  |            |           |
|--------------|--|------------|-----------|
| Issued by    |  | Checked by |           |
| Confirmed by |  | Date       | 2007/3/30 |

## 1 Summary of the Test results

The test fixture was made for further testing, which was shown below.



## 2. Test Result

### 2.1 RF Performance

#### 2.1.1 S11 Measurement

The S11 parameter was performed using a Hewlett Packard E5071B Network Analyzer. We use a 45cm long 1.13 cable to mitigate surface currents on the outside of the testing cable.

We used no matching circuit .

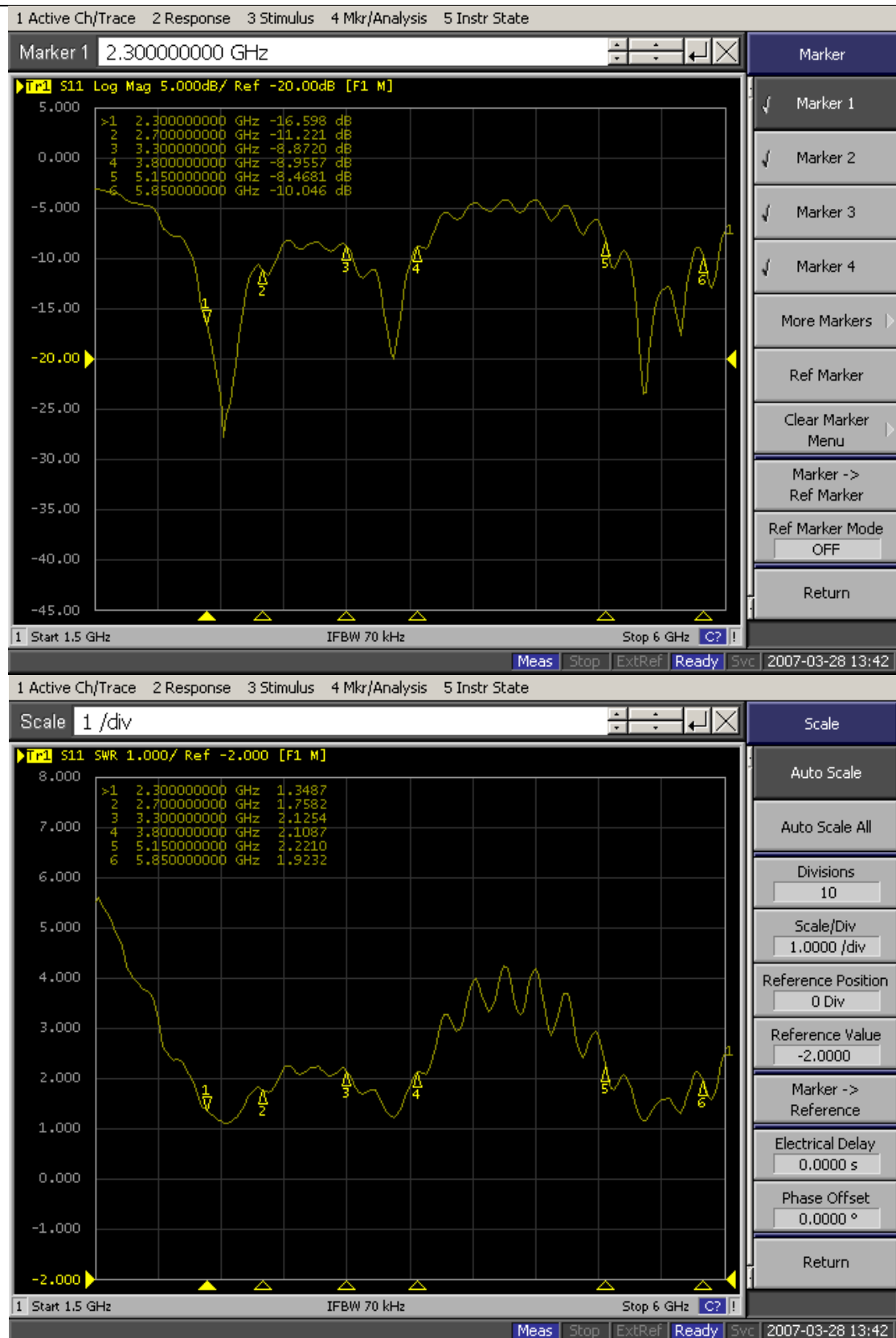
The S11 parameter was shown below, you could check it.

| SUC ANT S11 parameter Summary |                                 |        |       |       |       |        |
|-------------------------------|---------------------------------|--------|-------|-------|-------|--------|
| Band                          | 2.3 ~2.7&3.3~3.8&5.15~5.85(GHz) |        |       |       |       |        |
|                               | 2.3                             | 2.7    | 3.3   | 3.8   | 5.15  | 5.85   |
| R.L (dB)                      | -16.59                          | -11.22 | -8.87 | -8.96 | -8.46 | -10.04 |
| VSWR                          | 1.35                            | 1.76   | 2.13  | 2.11  | 2.22  | 1.92   |

You could also check in detail in below figures.

**S11 parameter of sample antenna tested in free space**

# Confidential Information



## 2.1.2 Radiation pattern and Gain Measurement

An anechoic chamber was used to measure radiation pattern and antenna Gain. SUC's chamber was working from 700MHz to 6GHz. The chamber provides less than -40 dB reflectivity from 700 MHz through 6 GHz. A standard horn was used to calibrate the chamber, and we also use a decoupling sleeve to reduce feed line radiation, so we can measure the antenna gain accurately.

The Gain parameter was shown below, you could check it.

| SUC ANT Gain parameter Summary |           |       |       |       |       |       |       |
|--------------------------------|-----------|-------|-------|-------|-------|-------|-------|
| Band                           | 2.4(GHz)  |       |       |       |       |       |       |
|                                | 2.3       | 2.35  | 2.4   | 2.45  | 2.5   | 2.6   | 2.7   |
| MAX Gain (dBi)                 | 3.22      | 3.54  | 3.24  | 2.97  | 3.16  | 3.47  | 2.8   |
| Efficiency (%)                 | 74.48     | 73.72 | 73.39 | 72.52 | 74.29 | 88.94 | 74.38 |
| SUC ANT Gain parameter Summary |           |       |       |       |       |       |       |
| Band                           | 3.4 (GHz) |       |       |       |       |       |       |
|                                | 3.3       |       | 3.5   |       |       | 3.8   |       |
| MAX Gain (dBi)                 | 4.54      |       | 3.59  |       |       | 4.38  |       |
| Efficiency (%)                 | 70.9      |       | 72.85 |       |       | 77.4  |       |
| SUC ANT Gain parameter Summary |           |       |       |       |       |       |       |
| Band                           | 5.4 (GHz) |       |       |       |       |       |       |
|                                | 5.15      | 5.25  | 5.35  | 5.45  | 5.75  | 5.85  |       |
| MAX Gain (dBi)                 | 3.64      | 2.57  | 3.73  | 4.77  | 4.43  | 4.97  |       |
| Efficiency (%)                 | 61.74     | 60.1  | 78.92 | 85.58 | 78.31 | 69.99 |       |

The radiation pattern was shown below, you could check it.

## Confidential Information

S

Location: **RF Chamber**

Date: **2007-3-30**

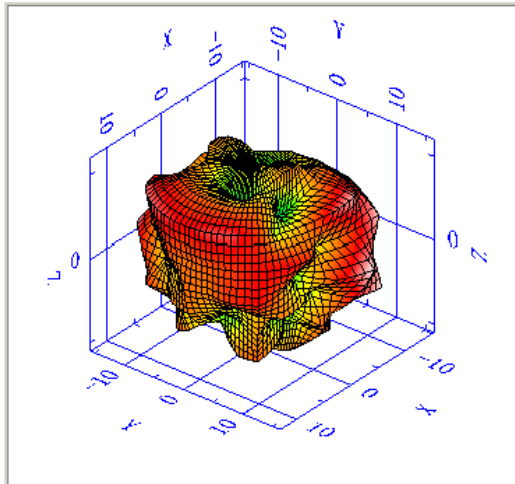
Time: **11:00:23**

Temperatuer ( ): **22.00**

Humidity (%): **65.00**

Approved by:

### Total View



Frequency (MHz)

2300.00

TRP (dBm)

-1.28

Efficiency (%)

74.48

NHPRP +/- 45 (dBm)

-1.85

NHPRP +/- 30 (dBm)

-2.66

Directivity (dBi)

4.5

Gain (dBi)

3.22

Average Gain (dB)

-1.28

Peak EIRP (dBm)

3.22

Max. Power (dBm)

3.22

Min. Power (dBm)

-13.68

Avg. Power (dBm)

-2.17

Max. / Min. Ratio (dB)

16.89

Max. / Avg. Ratio (dB)

5.39

Min. / Avg. Ratio (dB)

-11.51

**2.3GHz**

S

Location: **RF Chamber**

Date: **2007-3-30**

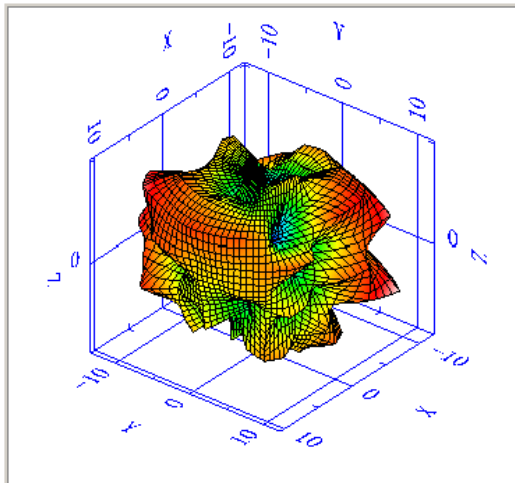
Time: **11:00:37**

Temperatuer ( ): **22.00**

Humidity (%): **65.00**

Approved by:

### Total View



Frequency (MHz)

2350.00

TRP (dBm)

-1.32

Efficiency (%)

73.72

NHPRP +/- 45 (dBm)

-1.89

NHPRP +/- 30 (dBm)

-2.76

Directivity (dBi)

4.87

Gain (dBi)

3.54

Average Gain (dB)

-1.32

Peak EIRP (dBm)

3.54

Max. Power (dBm)

3.54

Min. Power (dBm)

-11.17

Avg. Power (dBm)

-2.18

Max. / Min. Ratio (dB)

14.72

Max. / Avg. Ratio (dB)

5.72

Min. / Avg. Ratio (dB)

-9

**2.35GHz**

## Confidential Information

S

Location: **RF Chamber**

Date: **2007-3-30**

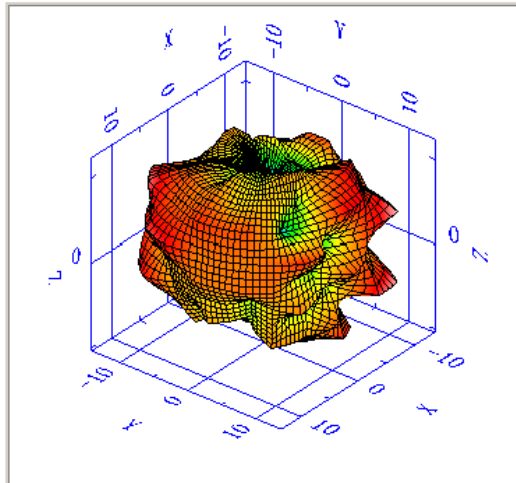
Time: **11:01:28**

Temperatuer ( ): **22.00**

Humidity (%): **65.00**

Approved by:

### Total View



Frequency (MHz)

2400.00

TRP (dBm)

-1.34

Efficiency (%)

73.39

NHPRP +/- 45 (dBm)

-1.89

NHPRP +/- 30 (dBm)

-2.79

Directivity (dBi)

4.58

Gain (dBi)

3.24

Average Gain (dB)

-1.34

Peak EIRP (dBm)

3.24

Max. Power (dBm)

3.24

Min. Power (dBm)

-13.08

Avg. Power (dBm)

-2.21

Max. / Min. Ratio (dB)

16.31

Max. / Avg. Ratio (dB)

5.45

Min. / Avg. Ratio (dB)

-10.87

## 2.4GHz

S

Location: **RF Chamber**

Date: **2007-3-30**

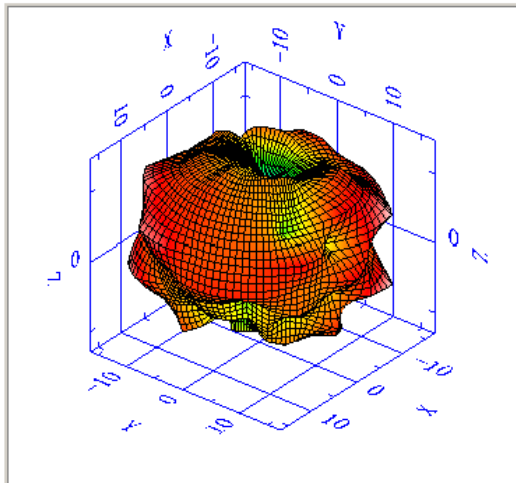
Time: **11:01:34**

Temperatuer ( ): **22.00**

Humidity (%): **65.00**

Approved by:

### Total View



Frequency (MHz)

2450.00

TRP (dBm)

-1.4

Efficiency (%)

72.52

NHPRP +/- 45 (dBm)

-1.87

NHPRP +/- 30 (dBm)

-2.71

Directivity (dBi)

4.37

Gain (dBi)

2.97

Average Gain (dB)

-1.4

Peak EIRP (dBm)

2.97

Max. Power (dBm)

2.97

Min. Power (dBm)

-16.47

Avg. Power (dBm)

-2.28

Max. / Min. Ratio (dB)

19.44

Max. / Avg. Ratio (dB)

5.25

Min. / Avg. Ratio (dB)

-14.19

## 2.45GHz

## Confidential Information

S

Location: **RF Chamber**

Date: **2007-3-30**

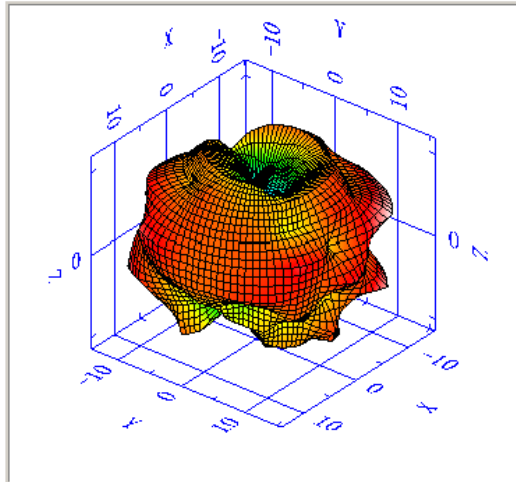
Time: **11:01:41**

Temperatuer ( ): **22.00**

Humidity (%): **65.00**

Approved by:

### Total View



Frequency (MHz)

2500.00

TRP (dBm)

-1.29

Efficiency (%)

74.29

NHPRP +/- 45 (dBm)

-1.71

NHPRP +/- 30 (dBm)

-2.61

Directivity (dBi)

4.45

Gain (dBi)

3.16

Average Gain (dB)

-1.29

Peak EIRP (dBm)

3.16

Max. Power (dBm)

3.16

Min. Power (dBm)

-14.26

Avg. Power (dBm)

-2.22

Max. / Min. Ratio (dB)

17.42

Max. / Avg. Ratio (dB)

5.38

Min. / Avg. Ratio (dB)

-12.04

**2.5GHz**

S

Location: **RF Chamber**

Date: **2007-3-30**

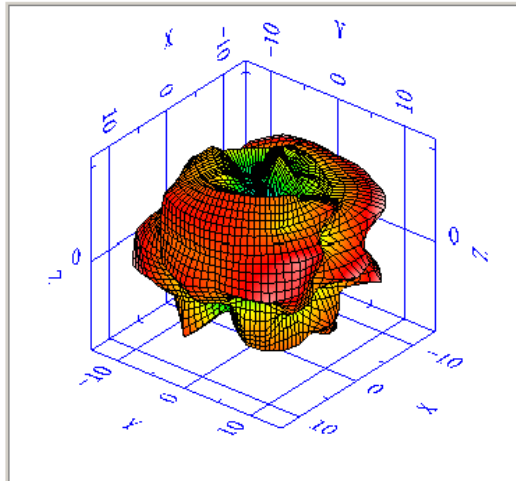
Time: **11:01:48**

Temperatuer ( ): **22.00**

Humidity (%): **65.00**

Approved by:

### Total View



Frequency (MHz)

2600.00

TRP (dBm)

-0.51

Efficiency (%)

88.94

NHPRP +/- 45 (dBm)

-0.91

NHPRP +/- 30 (dBm)

-1.82

Directivity (dBi)

3.98

Gain (dBi)

3.47

Average Gain (dB)

-0.51

Peak EIRP (dBm)

3.47

Max. Power (dBm)

3.47

Min. Power (dBm)

-11.83

Avg. Power (dBm)

-1.32

Max. / Min. Ratio (dB)

15.29

Max. / Avg. Ratio (dB)

4.78

Min. / Avg. Ratio (dB)

-10.51

**2.6GHz**

## Confidential Information

S

Location: **RF Chamber**

Date: **2007-3-30**

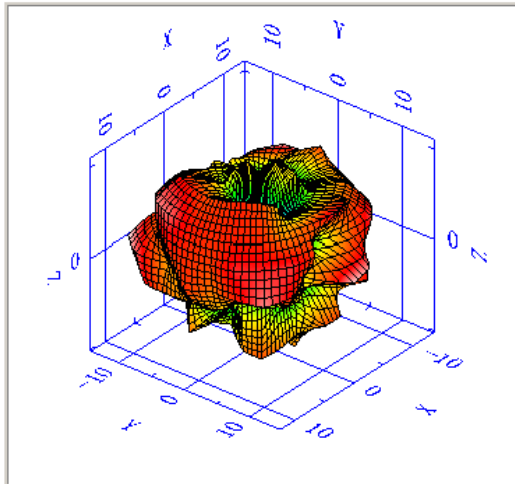
Time: **11:01:54**

Temperatuer ( ): **22.00**

Humidity (%): **65.00**

Approved by:

### Total View



Frequency (MHz)

2700.00

TRP (dBm)

-1.29

Efficiency (%)

74.38

NHPRP +/- 45 (dBm)

-1.73

NHPRP +/- 30 (dBm)

-2.52

Directivity (dBi)

4.09

Gain (dBi)

2.8

Average Gain (dB)

-1.29

Peak EIRP (dBm)

2.8

Max. Power (dBm)

2.8

Min. Power (dBm)

-12.24

Avg. Power (dBm)

-1.98

Max. / Min. Ratio (dB)

15.05

Max. / Avg. Ratio (dB)

4.78

Min. / Avg. Ratio (dB)

-10.27

**2.7GHz**

S

Location: **RF Chamber**

Date: **2007-3-30**

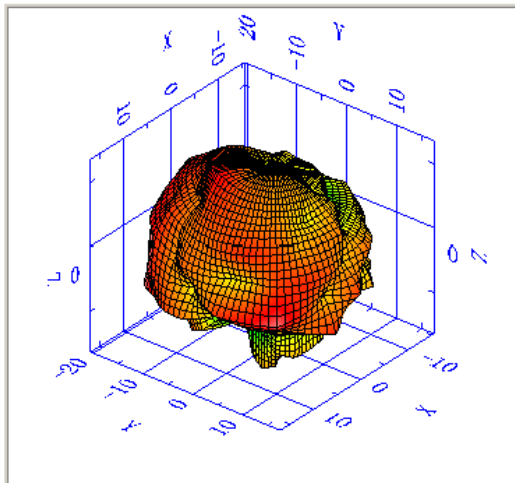
Time: **11:02:03**

Temperatuer ( ): **22.00**

Humidity (%): **65.00**

Approved by:

### Total View



Frequency (MHz)

3300.00

TRP (dBm)

-1.49

Efficiency (%)

70.9

NHPRP +/- 45 (dBm)

-2.18

NHPRP +/- 30 (dBm)

-2.96

Directivity (dBi)

6.04

Gain (dBi)

4.54

Average Gain (dB)

-1.49

Peak EIRP (dBm)

4.54

Max. Power (dBm)

4.54

Min. Power (dBm)

-16.7

Avg. Power (dBm)

-2.05

Max. / Min. Ratio (dB)

21.25

Max. / Avg. Ratio (dB)

6.59

Min. / Avg. Ratio (dB)

-14.65

**3.3GHz**

## Confidential Information

S

Location: **RF Chamber**

Date: **2007-3-30**

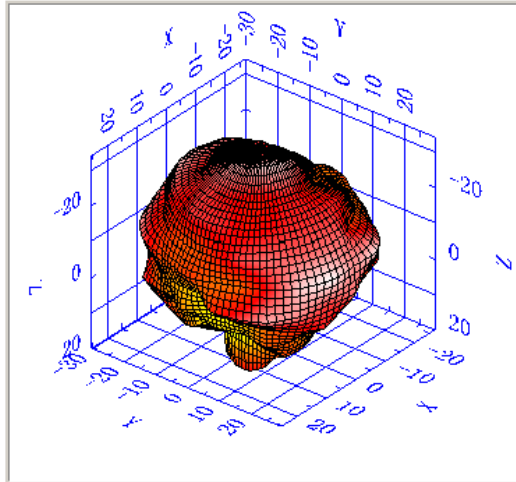
Time: **11:02:14**

Temperatuer ( ): **22.00**

Humidity (%): **65.00**

Approved by:

### Total View



Frequency (MHz)

3500.00

TRP (dBm)

-1.38

Efficiency (%)

72.85

NHPRP +/- 45 (dBm)

-2.26

NHPRP +/- 30 (dBm)

-3.25

Directivity (dBi)

4.97

Gain (dBi)

3.59

Average Gain (dB)

-1.38

Peak EIRP (dBm)

3.59

Max. Power (dBm)

3.59

Min. Power (dBm)

-27.9

Avg. Power (dBm)

-1.23

Max. / Min. Ratio (dB)

31.49

Max. / Avg. Ratio (dB)

4.82

Min. / Avg. Ratio (dB)

-26.67

**3.5GHz**

S

Location: **RF Chamber**

Date: **2007-3-30**

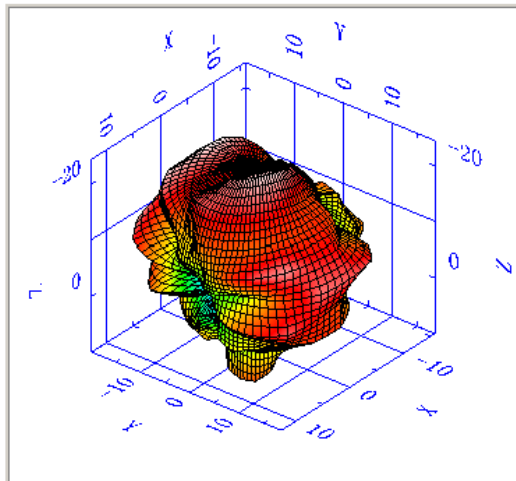
Time: **11:02:21**

Temperatuer ( ): **22.00**

Humidity (%): **65.00**

Approved by:

### Total View



Frequency (MHz)

3800.00

TRP (dBm)

-1.11

Efficiency (%)

77.4

NHPRP +/- 45 (dBm)

-2.31

NHPRP +/- 30 (dBm)

-3.34

Directivity (dBi)

5.5

Gain (dBi)

4.38

Average Gain (dB)

-1.11

Peak EIRP (dBm)

4.38

Max. Power (dBm)

4.38

Min. Power (dBm)

-16.55

Avg. Power (dBm)

-0.69

Max. / Min. Ratio (dB)

20.93

Max. / Avg. Ratio (dB)

5.07

Min. / Avg. Ratio (dB)

-15.86

**3.8GHz**

## Confidential Information

S

Location: **RF Chamber**

Date: **2007-3-30**

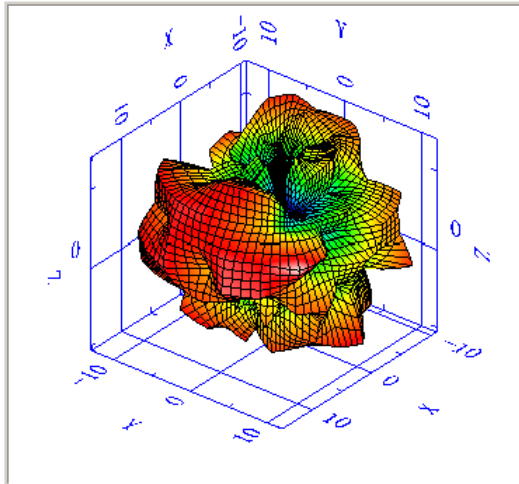
Time: **11:02:28**

Temperatuer ( ): **22.00**

Humidity (%): **65.00**

Approved by:

### Total View



Frequency (MHz)

5150.00

TRP (dBm)

-2.09

Efficiency (%)

61.74

NHPRP +/- 45 (dBm)

-2.84

NHPRP +/- 30 (dBm)

-3.98

Directivity (dBi)

5.73

Gain (dBi)

3.64

Average Gain (dB)

-2.09

Peak EIRP (dBm)

3.64

Max. Power (dBm)

3.64

Min. Power (dBm)

-13.26

Avg. Power (dBm)

-2.36

Max. / Min. Ratio (dB)

16.89

Max. / Avg. Ratio (dB)

5.99

Min. / Avg. Ratio (dB)

-10.9

**5.15GHz**

S

Location: **RF Chamber**

Date: **2007-3-30**

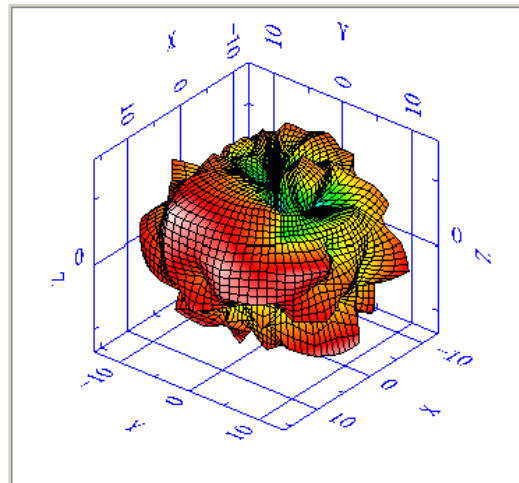
Time: **11:02:36**

Temperatuer ( ): **22.00**

Humidity (%): **65.00**

Approved by:

### Total View



Frequency (MHz)

5250.00

TRP (dBm)

-2.21

Efficiency (%)

60.1

NHPRP +/- 45 (dBm)

-2.99

NHPRP +/- 30 (dBm)

-4.2

Directivity (dBi)

4.78

Gain (dBi)

2.57

Average Gain (dB)

-2.21

Peak EIRP (dBm)

2.57

Max. Power (dBm)

2.57

Min. Power (dBm)

-15.24

Avg. Power (dBm)

-2.57

Max. / Min. Ratio (dB)

17.81

Max. / Avg. Ratio (dB)

5.14

Min. / Avg. Ratio (dB)

-12.67

**5.25GHz**

## Confidential Information

S

Location: **RF Chamber**

Date: **2007-3-30**

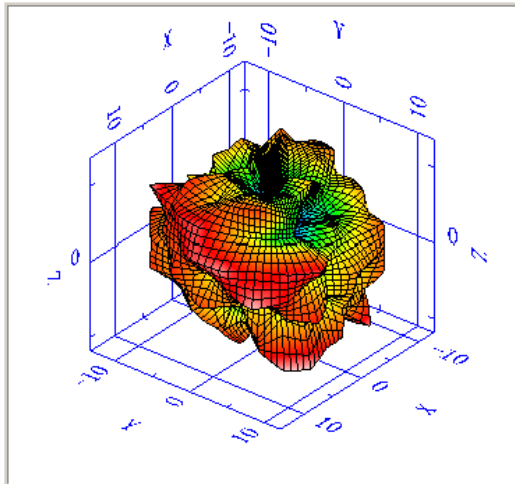
Time: **11:02:44**

Temperatuer ( ): **22.00**

Humidity (%): **65.00**

Approved by:

### Total View



Frequency (MHz)

5350.00

TRP (dBm)

-1.03

Efficiency (%)

78.92

NHPRP +/- 45 (dBm)

-1.79

NHPRP +/- 30 (dBm)

-3.07

Directivity (dBi)

4.76

Gain (dBi)

3.73

Average Gain (dB)

-1.03

Peak EIRP (dBm)

3.73

Max. Power (dBm)

3.73

Min. Power (dBm)

-12.15

Avg. Power (dBm)

-1.42

Max. / Min. Ratio (dB)

15.88

Max. / Avg. Ratio (dB)

5.15

Min. / Avg. Ratio (dB)

-10.73

**5.35GHz**

S

Location: **RF Chamber**

Date: **2007-3-30**

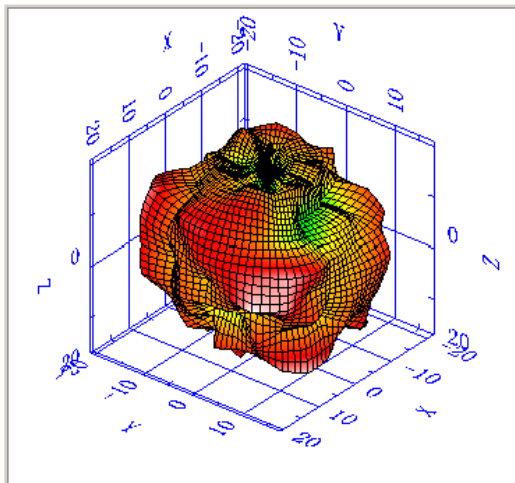
Time: **11:02:52**

Temperatuer ( ): **22.00**

Humidity (%): **65.00**

Approved by:

### Total View



Frequency (MHz)

5450.00

TRP (dBm)

-0.68

Efficiency (%)

85.58

NHPRP +/- 45 (dBm)

-1.36

NHPRP +/- 30 (dBm)

-2.68

Directivity (dBi)

5.44

Gain (dBi)

4.77

Average Gain (dB)

-0.68

Peak EIRP (dBm)

4.77

Max. Power (dBm)

4.77

Min. Power (dBm)

-19.17

Avg. Power (dBm)

-1.07

Max. / Min. Ratio (dB)

23.94

Max. / Avg. Ratio (dB)

5.83

Min. / Avg. Ratio (dB)

-18.11

**5.45GHz**

## Confidential Information

S

Location: **RF Chamber**

Date: **2007-3-30**

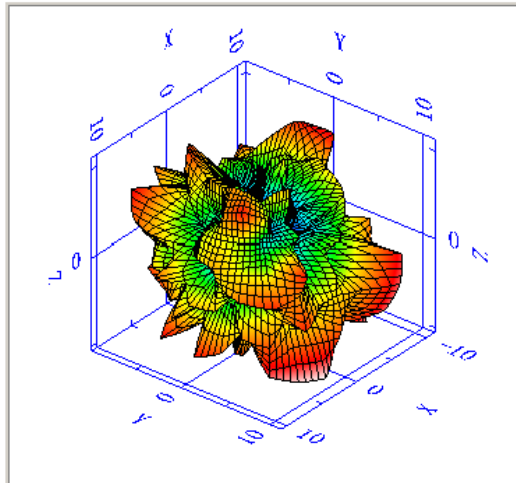
Time: **11:03:21**

Temperatuer ( ): **22.00**

Humidity (%): **65.00**

Approved by:

### Total View



Frequency (MHz)

5750.00

TRP (dBm)

-1.06

Efficiency (%)

78.31

NHPRP +/- 45 (dBm)

-1.82

NHPRP +/- 30 (dBm)

-3.15

Directivity (dBi)

5.49

Gain (dBi)

4.43

Average Gain (dB)

-1.06

Peak EIRP (dBm)

4.43

Max. Power (dBm)

4.43

Min. Power (dBm)

-10.02

Avg. Power (dBm)

-1.21

Max. / Min. Ratio (dB)

14.45

Max. / Avg. Ratio (dB)

5.64

Min. / Avg. Ratio (dB)

-8.81

**5.75GHz**

S

Location: **RF Chamber**

Date: **2007-3-30**

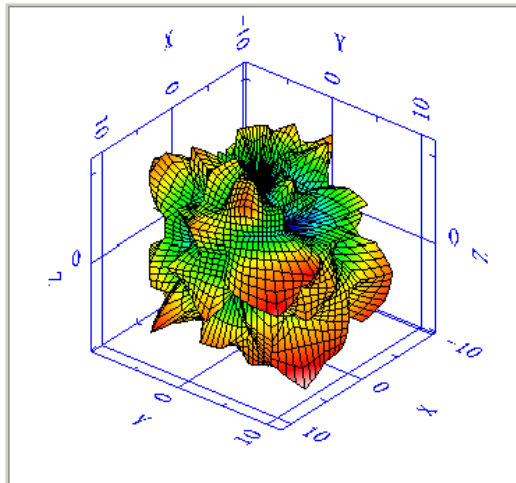
Time: **11:03:37**

Temperatuer ( ): **22.00**

Humidity (%): **65.00**

Approved by:

### Total View



Frequency (MHz)

5850.00

TRP (dBm)

-1.55

Efficiency (%)

69.99

NHPRP +/- 45 (dBm)

-2.42

NHPRP +/- 30 (dBm)

-3.81

Directivity (dBi)

6.52

Gain (dBi)

4.97

Average Gain (dB)

-1.55

Peak EIRP (dBm)

4.97

Max. Power (dBm)

4.97

Min. Power (dBm)

-10.66

Avg. Power (dBm)

-1.54

Max. / Min. Ratio (dB)

15.63

Max. / Avg. Ratio (dB)

6.51

Min. / Avg. Ratio (dB)

-9.12

**5.85GHz**